

# PATENT SPECIFICATION

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## (54) DRAIN TUBE FOR MEDICAL SUCTION DRAINAGE

(71) We, CAIUS BURRI, a Citizen of the Federal Republic of Germany, of Chirurgische Universitätsklinik, 79 Ulm, Federal Republic of Germany, LOTHAR KINZL, a Citizen of the Federal Republic of Germany, of Chirurgische Universitätsklinik, 79 Ulm, Federal Republic of Germany, ARNO MÜLLER, a Citizen of the Federal Republic of Germany, of 25, Schubertstrasse, 7901 Blaustein, Federal Republic of Germany, and DIETMAR WOLTER, a Citizen of the Federal Republic of Germany, of Chirurgische Universitätsklinik, 79 Ulm, Federal Republic of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be described in and by the following statement:—

The present invention relates to a drain tube for medical suction drainage.

In operations or injuries there is an accumulation in the region of the wound of blood and body fluids. In order to expedite the healing of the wound, it is necessary to remove this fluid by drainage.

It is known to use, for the removal of blood or body fluids, various drainage apparatus. There are for instance conduits of which one end is apertured. This end lies in the region of the wound, whilst the other is led out through the skin to the exterior. By the pressure in the body there is outflow of the wound secretions through the conduit. This occurrence can be considerably expedited by attachment of a suction device to the outer end. It is desirable that the part of the apertured drainage device lying in the body undergoes a suction operation throughout its entire length, in order thereby to ensure an optimum removal of the body fluids. Quantitative and experimental trials have nevertheless shown that only the first two to three openings of the drain in use undergo a suction operation.

The object of the present invention is to provide a body drain tube which develops an equal suction operation over the whole length of an apertured portion thereof.

According to a first aspect, of the present

invention there is provided a drain tube for medical suction drainage in which an end portion for placing in the region of a wound is provided in its wall with perforations spaced along the tube, is characterised in that the spacing between the centres of the perforations is constant longitudinally of the tube, and the diameters of the perforations become progressively larger towards the free end of the perforated portion of the tube.

The cross-sectional area of the apertures would depend upon the internal diameter of the drain tube, and upon the desired length of the apertured portion of the drain tube subjected to a suction operation.

The relationship is shown by the formula:

$$\Delta p_n = \Delta p (\text{total}) \left( \frac{g^1}{g (\text{total})} \right)^n$$

wherein:—

$\Delta p_n$  denotes the pressure drop in the apertured portion of the drain tube having  $n$  apertures

$\Delta p (\text{total})$  denotes the pressure drop in the drain tube as a whole

$g^1$  denotes the flow resistance of a suction aperture

$g (\text{total})$  denotes the flow resistance of all of the suction apertures collectively

$n$  denotes the number of suction apertures.

According to a second aspect of the invention there is provided a drain tube for medical suction drainage in which an end portion for placing in the region of a wound is provided in its wall with perforations spaced along the tube, is characterised in that the diameter of the perforations is constant, and the spacing between the centres of the perforations lessens progressively towards the free end of the perforated portion of the tube.

The apertures may be arranged in longitudinal rows which are offset by 90° or 180° about the axis of the tube, and the edges of the apertures may be rounded.

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The advantage of the invention is that, instead of having a drain tube which provides a suction operation only over a proportion of its apertured length, there is provided a drain tube which, as a result of the arrangement of the apertures and the size of the apertures, gives a suction operation over all of the apertured portion of its length. With such a drain tube, larger sizes of wound can be cleaned and drained than is the case with the previously known drain tubes.

Two embodiments of the invention are hereinafter particularly described with reference to the accompanying drawings, wherein:—

Fig. 1 is a longitudinal section through a first embodiment of drain tube with constant spacing of the apertures, and

Fig. 2 is a longitudinal section through a second embodiment of drain tube with varied spacing of the apertures.

The drain tube in both of figures 1 and 2 consists of a non-apertured portion 1 which in use leads from a wound through the body and the skin of the patient towards the exterior, and an apertured portion 2 which in use lies in the region of the wound. Through lateral apertures 3, as a result of the suction applied to the external end, the body fluids are sucked out and carried to the exterior. The spacing 4 in fig. 1 between the centres of apertures 3 are constant. The edges 5 of the apertures are evenly rounded. The apertures 3 increase their cross-sectional area linearly towards the interior end of the drain.

In contrast to the embodiment of fig. 1, the embodiment of fig. 2 has the spacings 4 reducing in the direction of the interior end of the drain, with constant cross-sectional area of the apertures.

#### WHAT WE CLAIM IS:—

1. A drain tube for medical suction drainage in which an end portion for placing in the region of a wound is provided in its wall with perforations spaced along the tube, characterised in that the spacing between the centres of the perforations is constant longitudinally of the tube, and the diameters of the perforations become progressively larger towards the free end of the perforated portion of the tube.

2. A drain tube for medical suction drainage in which an end portion for placing in the region of a wound is provided in its wall with perforations spaced along the tube, characterised in that diameter of the perforations is constant, and the spacing between the centres of the perforations lessens progressively towards the free end of the perforated portion of the tube.

3. A drain tube, for medical suction drainage, substantially as described herein with reference to fig. 1 or fig. 2 of the accompanying drawing.

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FIG.1

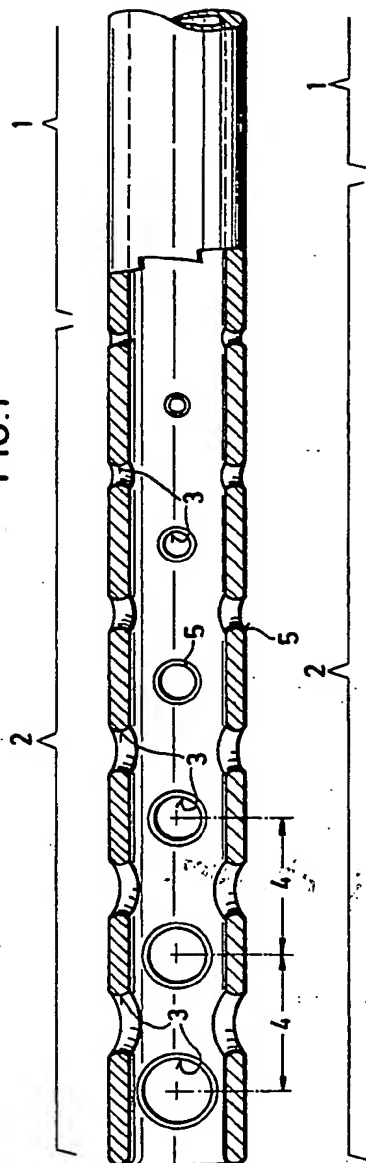
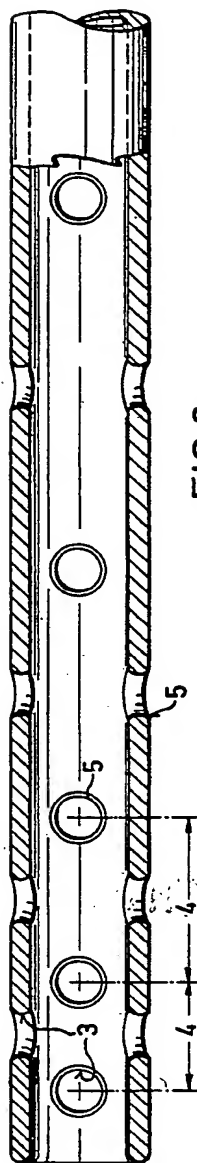


FIG.2



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